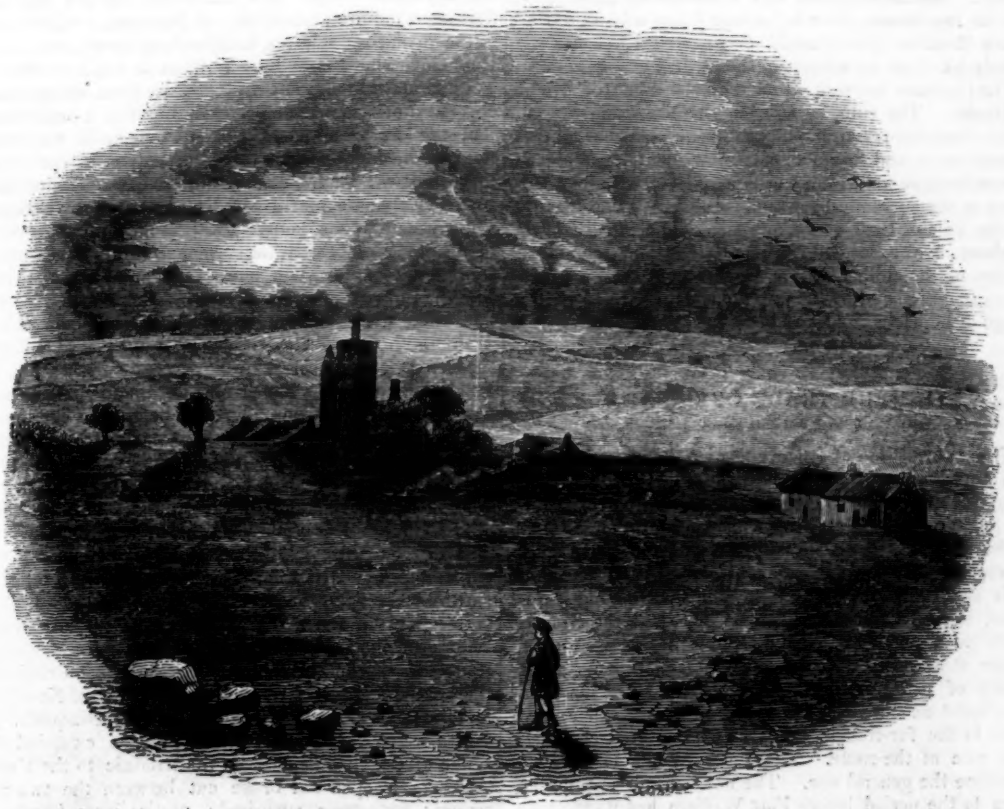
THE PENNY MAGAZINE

OF THE

Society for the Diffusion of Useful Knowledge.

376.] PUBLISHED EVERY SATURDAY. [FEBRUARY 10, 1838.

THE HARMUIR.



[The supposed scene of Macbeth's Interview with the Witches.]

> "Say from whence
> You owe this strange intelligence, or why
> Upon this *blasted heath* you stop our way
> With such prophetic greeting?"
>
> MACBETH.

THE traveller passing westward through the province of Moray is charmed with the beauty of the prospect that greets him on every side. The luxuriance of fertile fields, irrigated by countless rills, the far-spreading forests, with noble mansions towering from amid their umbrage,—the distant hills with their purple mantles of heath glowing beneath the glory of the sinking sun,—the peaceful hamlets and the smoking villages,—rivers rolling in their ancient channels, and the sail-burthened ocean, kissing with tiny waves the shells upon its sandy beach,—all combine to form a picture of captivating beauty. But when he has arrived at its extremity, and where it is united with the shire of Nairn, a very different scene is presented to his view:—a flat heath of great extent appears, disdaining every approach to cultivation; treeless and shrubless, save at its eastern boundary, where a clump of stunted firs and a few bushes of furze and broom wring a miserable existence from the arid soil. Here and there does a turf-built hovel or the roofless walls of a long-deserted hut rise from its surface. He feels his spirits sink as he contemplates the gloomy wilderness around him, and, on inquiry, he learns that it is called the Harmuir, and that common superstition assigns it as the spot where Macbeth had his interview with the Weird Sisterhood.

It would argue a frigidity of heart the reverse of enviable, were an individual not sensible of a quickening of the pulse at such an announcement. He traverses the scene of one of Shakspeare's mightiest enchantments! The region around once owned the dominion of the "posters of the sea and land."—Here crossed they the path of the man of destiny, soon to become the "fiend of Scotland," though then one of the greatest and best of her warriors. There dawned on his vision the fearful dreams whose accomplishment would

> "To all his nights and days to come
> Give solely sov'reign sway and masterdom."

The spectator is spell-bound, as his memory alternately dwells on these "bubbles of the earth,"—on the king-killing usurper; and last of all, on that grand incarna-

tion of peerless ambition and unyielding energy in the accomplishment of guilty purpose, his queenly sharer of "the golden round." Such will be the case under any circumstances; but if he be overtaken there by a convulsion of the elements, when earth and sky are at enmity, when the neighbouring sea is lashed into fury by the emancipated winds, and when the gull or the raven gives utterance to its wild notes above his head, how the interest is heightened! It is worth a thousand stage elucidations of the passage. And if, haply, he should be thither bound, and ignorant concerning the distance, he can put the identical question of Banquo, "How far is't called to Forres?" and the only drawback to the romance would be, that the respondent, though "wither'd and wild in attire" as any Rosa or Callot could desire, would yet look extremely like "an inhabitant o' the earth."

The Harmuir is chiefly situated on the estate of Brodie of Brodie. The ruin, as seen in the drawing, was, till within the termination of last century, a residence of that ancient race; and forms an extremely picturesque object, harmonising so well, in its dismantled state, with the dreariness of the surrounding waste. In the extreme distance are the hills of Ross and Caithness. The *blasted heath* is about five miles west from Forres, and remains as worthy of the epithet still, as when, seven centuries ago, it was so designated by the imperious Macbeth—a perfect image of hopeless desolation!

THE FUR TRADE OF CANADA.

[Concluded from page 48.]

The natural line of communication between Montreal and Fort William would appear to be by the lakes. But though a portion of the traffic was carried by this line, the greater part of it was taken up and down the Ottawa. If the reader look at the map, he will see that the St. Lawrence, or Cataraqui, above Montreal, and lakes Ontario and Erie, lie south-west, and that having passed these, the St. Clair and lakes Huron and Superior lie north-west. This caused the route to be circuitous; and before steamboats were brought into operation, the necessity of using sailing vessels on the lakes made the *time* spent on the voyage a matter of far greater importance to the fur-traders than the comparative cheapness and ease of the route. The route by the Ottawa was therefore the general one. The following description applies to the period before Fort William lost its metropolitan distinction, after the junction of the North-west and Hudson's Bay Companies in 1821.

The "brigade" of canoes being assembled in the bay or harbour of La Chine, at the upper end of the island of Montreal, about the beginning of May, the usual time for the channel to be clear of ice—the goods for barter being made up in packages—the pork, biscuit, and pease laid in, and the voyageurs assembled, the signal is given for departure. They then cross to the north bank of the St. Lawrence, where, through the wide channel called the Lake of the Two Mountains, the Ottawa joins it. The Lake of the Two Mountains, as the mouth of the Ottawa is called, is about twenty miles long, and about three wide; at the end of it, or rather the beginning of it, the channel contracts, and is known as the Ottawa. Fifteen miles higher up there are a series of rapids. The first actual severe toil of the voyageurs commences here. For about sixteen or eighteen days, during which they ascend about 280 miles, they have, at intervals, to lighten the canoes, carrying the goods and towing the vessels, or carrying canoes and goods together. The places at which the first operation is carried on, are called *les décharges;* the second, *les portages*. They then leave the Ottawa by a river and portage, which brings them to Lake Nippissing, and from thence, by another river which abounds with rapids, into the upper portion of Lake Huron. On reaching Lake Superior, they coast along its northern shores till they arrive at Fort William.

The "winterers" are now beginning to arrive from the interior; and if the cargoes of furs are abundant, the scene is very animating. Business is not neglected; the furs are reckoned and assorted; the packages are arranged, and marked for distribution. Accounts are settled, wages are paid, new engagements are entered into, and stores of rations are provided. But after dinner, proprietors and clerks, with interpreters and guides, make merry in the great hall, and voyageurs and Indians in the court-yard. Porkmen, or "comers and goers," ask the northmen about their adventures in the interior; northmen inquire after friends at Montreal. "Most part of the voyageurs, soldiers, Indians, half-breeds, &c.," says Ross Cox, who was at Fort William in 1817, "were encamped outside the fort in tents, leathern lodges, mat-covered huts, or wigwams. On inquiry, I ascertained that the aggregate number of the persons in and about the establishment was composed of natives of the following countries: England, Ireland, Scotland, France, Germany, Italy, Denmark, Sweden, Holland, Switzerland, United States, Canadians, Africans, and a mixed progeny of Creoles." Though the *voyageurs* are characterised by habits of submission and obedience, they were apt, like the Indians, to forget themselves during the carnival; and there was therefore a prison or black-hole at Fort William, in which the refractory were placed till they recovered their senses.

The activity of the North-west Company stirred that of the Hudson's Bay Company, and before the commencement of the present century there was a strong spirit of mutual jealousy and opposition manifested. The Hudson's Bay Company laid claim to an exclusive right of trading in a large portion of the country where the North-west Company had established their forts; but the claim was disregarded. Meantime the two companies were spreading their forts from Canada towards the Arctic Sea, and from the shores of Hudson's Bay to the Rocky Mountains; and in 1813, the North-west Company bought Astoria on the Columbia, which district, unlucky circumstances arising out of the war between Great Britain and the United States had compelled Mr. Astor, of New York, and the other partners of his company, to relinquish. The North-west Company, by this acquisition, extended their range of establishments from the Atlantic to the Pacific. At last an open war broke out between the two companies; forts were surprised; parties were intercepted and taken prisoners; and a country already far enough from the wholesome restraints of the law, was rendered still more lawless by the strife. But this course, which was suicidal to both companies, was stopped by the junction of the North-west Company with the Hudson's Bay Company in 1821; and the united body, under the latter name, now claim the entire continent of North America, from the frontiers of Canada and the United States to the Frozen Ocean, and from the shores of Labrador to those of the Pacific, as their "field of chase."

We may mention at least one good result from the junction of the two companies. The fondness of the Indians for rum is well known; and the competition between the North-west and Hudson's Bay Companies enabled the thoughtless creatures to dictate partly their own terms: rum was a principal article in demand. For some years, however, the Hudson's Bay Company have declined including rum amongst the articles of barter; and there are only about 40 puncheons of spirits sent out annually, the greater portion of which goes to the border country, where competition still prevails between the United States Fur Company and the Hudson's Bay Company.

The animals hunted in the fur country of North America are, bears of various kinds and colours, several varieties of foxes, beavers, racoons, badgers, minks,

lynxes, musk-rats, rabbits, hares, and squirrels. The bison, which is now found wandering north beyond the Great Slave Lake, is pursued by the hunters for the sake of his flesh and skin. The fur of the black, sometimes called the silver fox, is considered the most valuable. The fur of the red fox is exported to China, where it is used for trimmings, linings, and robes, which are ornamented in spots or waves with the black fur of the paws of the same animal. Sometimes the skin of the white arctic fox and of the polar bear are found in the packs brought to the European traders by the most northern tribes of Indians.

The value attached to the skins of the black bears caused very considerable havoc to be made amongst them; the flesh of the animal is also much esteemed by the Indians and hunters. The importation of skins of the black bear into England in 1783 was 10,500; in 1803, it was 25,000; but there has been a very great decline since that time, for the entire number of bear skins (colour not specified, but mostly black) imported into England in 1835 from the British North American colonies was 4,829; there were, however, 10,184 in the same year imported from the United States. A black bear's skin, that once fetched from twenty to forty guineas, is not now worth more than from twenty to sixty shillings.

The beaver has suffered more severely than any other of the fur-producing animals. In 1788, upwards of 170,000 were exported from Canada; and in 1808, no less than 126,927 were sent from Quebec alone to this country. The value of these last has been estimated at 118,994*l.* 1*s.* 3*d.* sterling, at an average of 18*s.* 9*d.* for each skin. These numbers could not be kept up without total extermination; and we find, accordingly, that in 1827 the importation into London from a fur country of more than four times the extent of that which was occupied in 1743, was but little more than 50,000. In 1829 there was an increase, there being 72,199 beaver skins imported from the British North American colonies, and 4,200 from the United States; and in 1835 there were 85,933 imported from our own colonies, and 2,316 from the United States. The skin of another animal, the coypu, has, since 1810, been imported from South America, under the name of Nutria skins, and it is now largely used as a substitute for beaver skins.*

J. H. Pelly, Esq., governor of the Hudson's Bay Company, in evidence given before the Committee of the House of Commons on the Aborigines of British Settlements (March, 1837), says that the Company now maintain beaver preserves in their territories. Whenever the animal begins to disappear in any quarter, the post or fort in the neighbourhood is removed, and of course the natives also.

The importations of fur-skins into England in 1835 were:—

	British North American Colonies.	United States.	Total from all Countries.
Bear . .	4,829	10,184	15,041
Beaver . .	85,933	2,316	88,400
Fitch . .	12	40	47,586
Marten . .	71,068	47,253	159,954
Mink . .	25,297	82,950	115,501
Musquash	1,147,725	23,232	1,171,659
Nutria . .	4	—	557,600
Otter . .	17,989	143	18,374
Seal . .	322,186	2,081	339,683

The numbers re-exported in the same year, of those species of which the Custom-House Returns have been given, were:—

Countries to which exported.	Bear.	Marten.	Musquash.	Otter.
Russia . . .	331	—	—	—
Prussia . .	85	—	—	650
Germany . .	8,753	5,106	6,507	13,157
Holland . .	207	351	50,425	205
Belgium . .	—	188	—	—
France . .	1,663	11,222	—	—
Italy . . .	229	—	—	—
Turkey . .	—	281	—	—
China . . .	—	—	—	520
United States of America	146	813	164,558	9,912
	11,414	17,961	221,490	24,444

In 1836 the number of undressed furs entered for home consumption was:—Bear, 2322; beaver, 87,473; cat and lynx, 58,937; coney, 665,991; ermine, 284,488; fitch, 122,741; fox, 18,977; marten, 197,804; mink, 62,467; musquash, 784,379; nutria, 1,328,017; otter, 952; racoon, 1525; and squirrel, 2,236,725.

Mackenzie gives the following as the produce of the North-west Company in 1798, which may be compared with the produce of 1835, from an extent of territory at least six times the size of that hunted by the North-west Company in 1798, for it includes the importation into England from the United States:—

Produce of the North-west Company in 1798.

Beaver . . .	106,000	Mink	1,800
Bear	2,100	Lynx	6,000
Fox	1,500	Wolverine . .	600
Kitt Fox . .	4,000	Racoon . . .	100
Otter	4,600	Wolf	3,800
Musquash . .	17,000	Elk	700
Marten . . .	32,000	Deer	750

with 1200 dressed deer-skins, 500 robes of bison-skins, and 1650 other skins.

The most noted of the numerous establishments of the Hudson's Bay Company are Churchill Fort, York Factory, and Moose Fort, on Hudson's Bay; Fort William on Lake Superior; Norway House on Lake Winipeg; various forts and houses on the rivers which descend from the Rocky Mountains, such as Carlton House on the north branch of the Saskatchewan, Chesterfield House on the south branch, and Cumberland House on the united or main stream of the same river, which falls into Lake Winipeg; Fort Chipewyan on the Athabasca Lake, from whence Mackenzie set out on his two expeditions; Fort Resolution on Great Slave Lake; and Forts Simpson, Norman, and Good Hope, on the Mackenzie River; the latter is the most northerly establishment, and is about 3800 miles from Montreal. The furs, however, which are procured at the most northern establishments are shipped from Hudson's Bay. All the routes taken by the fur-traders are chains of lakes and rivers, connected by links of portages, some of them very toilsome to the voyageurs, who must carry canoes and packages over them.

We may here mention some of the distances between a few of the forts, though the mere enumeration of the number of miles, without a statement of the portages on the routes, their length and character, will give a faint idea of the nature of the travelling:—From Fort William on Lake Superior to Cumberland House the distance is 1018 miles; from Cumberland House to Fort Chipewyan, 840 miles; from Fort Chipewyan to Fort Resolution on Great Slave Lake is 240; the Mackenzie issues from Great Slave Lake; the first fort on it, Fort Simpson, is 338 miles from Fort Resolution; the second, Fort Norman, is 236 miles lower down than Fort Simpson; and Fort Good Hope is 312 miles below Fort Norman, or 886 miles from Fort Resolution. Yet the clerks in charge of these forts look upon each other as neighbours. A winter's residence at one of the northern forts must be

* See the 'Penny Cyclopædia:' articles Bear, Beaver, Fur Trade, &c. The bear, beaver, bison, &c., have been described in the 'Penny Magazine.

indeed dreary. "At a great number of our posts," says Mr. Pelly, the governor of the Hudson's Bay Company, "the potatoes are cut off even by summer frosts, and they cannot grow corn." Pemmican, or dried meat, is then the chief article of subsistence. Mr. Pelly was asked before the Parliamentary Committee—"The posts you state to be very numerous; at those posts is there an ample supply of food for the winter consumption always laid up?"—"There is," he replies. "If natives, suffering from the effects of scarcity, apply during the winter at those posts, do they receive such supplies as the company are enabled to afford them?"—"Always, I believe. .... The natives, if they are in a state of starvation, come down and live at the post altogether, and are then maintained by the Company."

We have already mentioned that the clerks of the united fur companies are mostly Scotchmen. Mr. Pelly says, "If they conduct themselves well as clerks, they are promoted, and become traders, and afterwards factors. The chief factors and chief traders, as they are called, participate in the profits; they have emoluments from the profits of the trade."

The voyageurs, or French-Canadian boatmen, are certainly a peculiar generation of men. As far as general knowledge is concerned, they are very ignorant, and they are also very superstitious: of which an amusing instance is related by Sir John Franklin. On his second journey, when he and Captain Back were taking observations, one of the voyageurs watched the operation; and hearing the words "now," "stop," always followed by silence, he went to his companions and told them that the officers were raising the devil! But the voyageurs are, notwithstanding, an affectionate, attached, and laborious class of men. They are easily offended if their prejudices are touched, and they sometimes display Indian vindictiveness. But their French origin is easily indicated; bestow some kind words, a little of that which can hardly be termed flattery, praising their skill as boatmen, &c., and they will do any service for those in command over them.

[Canadian Voyageurs, from Captain Basil Hall's North American Sketches.]

The wood-cut above represents *voyageurs* of Sir John Franklin's canoe, on his journey to the Polar Sea, taken from Captain Basil Hall's sketches. A few extracts from the narratives of Sir John Franklin, Captain Back, and Doctor Richardson, will illustrate the nature of the service in which the *voyageurs* are engaged. The first extract is rather long, but it shows the mode of travelling through the fur country.

"The boats of the expedition," says Sir John Franklin, in his 'Second Journey to the shores of the Polar Sea,' "had advanced from Hudson's Bay into the interior twelve hundred miles before they were joined by the officers; whilst the latter, from taking a more circuitous route by New York and Canada, travelled two thousand and eight hundred miles to reach the same point. This junction took place early in the morning of the 29th of June, 1825, in the Methye River, latitude 56° 10′ north, longitude 108° 55′ west, which is almost at the head of

the waters that flow from the north into Hudson's Bay. In no part of the journey was the presence of the officers more requisite to animate and encourage the crews, because the river itself is usually so shallow through its whole course of forty miles, as scarcely to admit of a flat-bottomed bateau floating with half its cargo, much less our boats, which drew, when loaded, from eighteen to twenty inches. This river and its impediments being surmounted, the Methye Portage, ten miles and three-quarters long, was at no great distance, which is always held up to the inexperienced voyageur as the most laborious part of the journey. But whatever apprehension the men might have entertained on this subject, seemed to vanish on our landing amongst them; and Dr. Richardson and myself were received by all with cheerful, delighted countenances, and by none more warmly than by our excellent friend and former interpreter Augustus the Esquimaux,* and Ooligbuck, whom he had brought from Churchill as his companion. A breakfast was quickly prepared by Mr. Fraser, a clerk of the Hudson's Bay Company, under whose charge the boats had been since their departure from Cumberland House; and I then inspected the boats and stores, which I was rejoiced to find were in good order. We had brought letters from the relatives of several of the party, and another hour was allowed to read them.

"At ten A.M. we began to ascend the stream, but very soon found that it was necessary for the whole party to walk in the water, and drag the boats through the mud. Nor could we long advance even by this mode, but were compelled either to carry some of the cargo along the shore, where walking was at all practicable, or else to take half the lading in a boat to a part where the river was deeper, and then return for the remainder. From thus travelling the distance twice over, it was the fifth day before we reached the lake from whence its waters flow.

"On the evening of the 30th of June, we witnessed one of those violent but momentary gusts of wind which occur not unfrequently in the spring and autumn, and which prove so destructive to the forests in this country. It was preceded by calm and very sultry weather, with loud thunder and vivid lightning. In an instant the tents were overthrown, and even very large trees were bent by its force into a horizontal position; indeed, for a few seconds, the scene around us appeared one of almost entire devastation. When the violence of the squall was past, we had great reason to be pleased at its occurrence, for the strong steady breeze and heavy rain that succeeded carried away the myriads of mosquitoes by which we had been tormented the whole day.

"Having crossed the Methye Lake, we arrived at the portage of that name. Here it was necessary to make an equal division of the cargoes, and to devise means for the conveyance of the boats. The packages amounted to one hundred and sixteen, weighing from seventy to ninety pounds each, exclusive of the three boats and the men's personal luggage; and there were nineteen men of the boats' crews, two Canadians, and two boys, to carry these burdens. At first the packages were equally distributed among this party: but several of the men, who had been reduced by their previous exertions, became lame; among these were the Esquimaux, and we were, therefore, compelled to make other arrangements, and ultimately to employ the crew of my canoe, though the great fatigue they had suffered in our rapid journey from Canada, made me desirous of sparing them for the present.

"The boats were the heaviest and most difficult articles to transport; one of the small boats was carried on the shoulders of eight men, of whom Mr. Fraser undertook to be one, as an example to the rest. Another of the same size was dragged by other eight men; and the largest was conveyed on a truck made for the purpose on the spot, to which service the lame were attached.

"Each day's journey, and also the intermediate stages, were determined by the places where water could be procured, and our mode of travelling was as follows:—rising at three A.M., the men carried a part of their burden to the first stage, and continued to go backwards and forwards till the whole was deposited. They then slept for a few hours, and in the cool of the evening the boats were brought up. By these means everything was ready at the western end of the portage early on Monday the 11th of July.

"With reference to the Methye Portage I may remark, that except the steep hill at its western extremity, the road is good and tolerably level, and it appeared that much fatigue and suffering might have been spared by using trucks. Accordingly, two were made by our carpenters at Fort Chipewyan in 1821, for the return of the expedition, and they answered extremely well. I mention this circumstance in the hope that some such expedient will be adopted by the traders for the relief of their voyageurs, who have twice in every year to pass over this ridge of hills."

The next extract is from the narrative of Captain Back's more recent expedition to the Arctic Sea in 1833—1835. It is short; and refers to a source of annoyance which diminishes greatly the pleasure of the brief summer in the fur country—the myriads of mosquitoes and sand-flies.

"There is certainly no form of wretchedness among those to which the chequered life of a *voyageur* is exposed, at once so great and so humiliating as the torture inflicted by those puny bloodsuckers. To avoid them is impossible; and as for defending himself, though for a time he may go on crushing by thousands, he cannot long maintain the unequal conflict; so that at last, subdued by pain and fatigue, he throws himself in despair with his face to the earth, and half suffocated in his blanket, groans away a few hours of sleepless rest."

Dr. Richardson relates another anecdote illustrative of the daring and ferocity of the grisly bear:—

"A party of voyageurs, who had been employed all day in tracking a canoe up the Saskatchewan, had seated themselves in the twilight by a fire, and were busy in preparing their supper, when a large grisly bear sprang over the canoe that was tilted behind them, and seizing one of the party by the shoulder, carried him off. The rest fled in terror, with the exception of a man named Bourasso, who grasping his gun, followed the bear as it was retreating leisurely with its prey. He called to his unfortunate comrade, that he was afraid of hitting him if he fired at the bear, but the latter entreated him to fire without hesitation, as the bear was squeezing him to death. On this he took a deliberate aim, and discharged his piece into the body of the bear, who instantly dropped its prey to pursue Bourasso. He escaped with difficulty, and the bear ultimately retreated to a thicket, where it is supposed to have died; but the curiosity of the party not being a match for their fears, the fact of its decease was not ascertained. The man who was rescued had his arm fractured, and was otherwise severely bitten, but finally recovered."

Ross Cox tells a similar story: the bear in this instance seized a voyageur from a group of ten Canadians seated round a blazing fire, enjoying a meal of deer's-flesh. As one of the party, several of whom followed, was watching an opportunity to fire, the prisoner called out, "Tirez!

* This worthy man, whose conduct is spoken of in the highest terms by Sir John Franklin, on hearing that Captain Back was once more in the country in 1833, set off from Hudson's Bay to join him, in company with a Canadian and an Iroquois. They lost their way, separated, and Augustus perished from want. "He was," says Captain Back, "a faithful, disinterested, kind-hearted creature, who had won the regard, not of myself only, but I may add, of Sir J. Franklin and Dr. Richardson also, by qualities which, wherever found, in the lowest as in the highest forms of social life, are the ornament and charm of humanity."

tirez! mon cher frère, si tu m'aimes. A la tête! à la tête!" (Fire, fire, my dear friend, if you love me—at the head, the head!) The bear was accordingly shot over the right temple, and was quickly afterwards despatched with a couteau de chasse, or hunting-knife. The liberated voyageur escaped without injury, except an ugly scratch over the face.

DOMESTIC CHEMISTRY.—III.

DOMESTIC WATERS (*concluded*).

3. *River Water.* We have stated that when rain falls on a mountainous district, the soil of which is porous, a large portion of the water percolates through the soil, and becomes the source of springs; but there are a large number of mountains in which the surface exposed to the weather is of a very hard and compact texture, such as granite, grauwacke slate, mountain limestone, &c., through which water cannot penetrate; or if the detritus of the upper portion of rock should have formed the materials for a thin stratum of vegetable soil, still that stratum would follow the contour of the surface, and would not present a sufficient body of soft soil to impart a mineral character to the water which soaks through it. Again; if any fissure be cleft in the rock, and connected with other fissures near the base of a mountain, the rain might flow through these channels without imbibing any new property from contact with the hard insoluble materials of the rock.

In all such cases as these, the water, when it has collected into one united stream at the bottom, becomes a *river;* and the water itself assumes the character of river water. It will thus be seen that the difference between spring water and river water does not arise from any distinctive qualities resident originally in the water itself, but from the path which it has followed previous to its employment by us. Spring water, by passing in very minute streams through a porous soil, gets into close and intimate contact not only with sandy or earthy soil, but with the metallic or saline bodies which may be contained in it, and is therefore much more likely to combine with a portion of those bodies in its passage than when the water merely flows over their surface. The least effect produced on water in this way is (as we have said) by lime, which makes it hard spring water. But in the streams which merely flow over the surface, small portions of sand, gravel, earth, pebbles, vegetable matter, &c., are washed down with the water, and mixed with it, but not chemically combined with it—a distinction worthy of notice. This difference may be illustrated thus: filtering may convert dirty river water into pure water by removing the impurities, because they are only mechanically mixed with the water; but filtering will not convert hard water into soft, because the lime which makes it hard is chemically combined with the water, and cannot be removed by filtration.

If there be a reservoir or lake at an elevated part of the mountain, this may furnish a source from which a small but constant supply may be furnished; and if there be several such reservoirs on different mountains and in the valleys between them, they may all ultimately meet in one channel; and thus the whole quantity of rain which falls over a great extent of mountain country may, after trickling down in narrow tortuous paths, be ultimately combined into one stream, which thus becomes a river. All the great rivers have an origin similar to this: the Brahmapootra and the Ganges take their rise from the Himalaya Mountains at the north of India, the highest in the world; the Nile derives its waters from the rain which pours down in tremendous torrents upon the Mountains of the Moon in Central Africa; the Amazon collects the waters of a long range of the Andes Mountains on the western side of South America; the Mississippi rises in the Rocky Mountains of North America, &c. The smaller rivers either follow a shorter course before they reach the sea, or else rise in a less mountainous district, and consist of but a few springs or streams instead of an assemblage of many.

River water is the most important source for domestic and for dietary use, for two reasons; 1st, the extensive course which the rivers follow from their source to the sea renders them available for a large number of towns; and 2nd, the water is not so much affected by extraneous mineral bodies as spring water is allowed to be. Nearly all large towns are situated near one or more running rivers, both for convenience of manufactures and for domestic uses; but it frequently happens that the water in one river is not so fit for drinking as that of another at some little distance from it. Hence the construction of those stupendous buildings, the aqueducts of the ancients, many of which remain at the present day as monuments both of the industry of the early ages and of their ignorance of the principles of hydrostatics; for the source from which the water was conveyed was always higher than the place to which it flowed; and had they known the law that pipes conveyed underground, or along the surface of the ground, from one station to another, would have perfectly answered the purpose, however deep the intervening valley might be (provided the first station were higher than the second), they would have been under no necessity for building the immense aqueducts to which we have alluded. It has however been suggested that the nonemployment of water-pipes in early periods was not due so much to ignorance of that law as to the want of strong materials for the pipes.

The remains of a splendid aqueduct are visible near Paris, called the aqueduct of Maintenon, and built by Louis XIV. There are three courses of arches one above another, carried across a valley, and on the top course a stream flows from Marly to Versailles. There is also near Paris a subterranean aqueduct, constructed of freestone, the length of which is 14,920 yards, which has an inclination of an inch and a half in 100 yards, and has a foot-path at the side along its whole extent.

The recent improvements at London Bridge almost induce a forgetfulness that there were waterworks at that spot a few years ago. Many of our readers have, however, probably seen them. An immense wheel, 32 feet in diameter, with other appendages, were employed to raise water from the Thames to a considerable height, from whence it was conveyed in pipes to supply houses in that part of London. These works were commenced in 1581, when Queen Elizabeth granted a lease of one arch of London Bridge, for the purpose of erecting waterworks at that spot. Two years afterwards, the second arch was also leased for the same purpose; and at different periods three more arches were added. The machinery worked under the arches of the bridge, and brought up 45,000 hogsheads of water per day. When however, in 1763, two arches of the bridge were thrown into one, by the removal of a pier, the central flow of water was so much increased that the side arches, at which the machinery was placed, lost much of their wonted supply, and the quantity of water brought up diminished to 5000 hogsheads per day. Another arch was therefore granted, and Mr. Smeaton erected new works in 1767. When, however, the new London Bridge was built, the whole of the waterworks were removed, and the supply of water to the metropolis was undertaken by the various water companies which had been from time to time established.

The most celebrated of these companies is the New River Company, which dates its origin from the year 1608, when, by authority of government, the corporation formed a plan for bringing the water of two springs in Hertfordshire to London. The undertaking, however, proved too vast for them, and they made over the powers vested in them to Mr. Hugh Myddleton, who brought this great project to a successful issue. In doing so,

however, he ruined himself, and was obliged to seek for funds elsewhere: James I. provided him with what funds were necessary, on condition that he should have half the profits. In 1613 water first flowed into the New River Head at Pentonville, after a tortuous path of nearly 40 miles from the source in Hertfordshire. This winding course was given to it in order to insure a certain degree of inclination in the bed of the artificial channel by which the water was brought, and which inclination is three inches in a mile. Two hundred bridges cross this river from its source to its termination.

The other water companies on the north side of the Thames are the Chelsea, East London, Grand Junction, and West Middlesex. In 1821 a committee of the House of Commons was appointed to inquire into the supply of water to the metropolis; when it was found that the total quantity supplied by these four companies, by the New River, and the London-Bridge Waterworks, in one year, amounted to 155,381,038 hogsheads, which supplied 120,000 houses.

More than half of the whole quantity of water consumed is derived from the Thames. The unavoidable impurity of the water of a river which is the receptacle of the refuse matter of a large city, has given rise to inquiries into the practicability of obtaining water from purer rivers, in the same way as has been accomplished in the case of the New River. Mr. Telford, by order of the House of Commons, has surveyed several districts near the metropolis, with the view of ascertaining whether a supply could be obtained by such means. He found that the Verulam, a river flowing between Watford and St. Albans, produced 16,200,000 gallons of water daily; a quantity which is supposed to be amply sufficient for the supply of those parts of London north of the Thames, which have hitherto been supplied with Thames water. Mr. Telford proposes to bring the river Verulam by an artificial channel to the neighbourhood of Primrose Hill, where reservoirs might be formed at a height of 146 feet above the level of the Thames.

This supply would be destined for the north-west part of the metropolis. The north-east part would continue to be supplied by the New River; and Mr. Telford proposes to supply Southwark and Lambeth from the River Wandle, which rises from a spring near Croydon, and which he proposes to bring to Clapham Common by an artificial course. At the latter place he proposes to construct reservoirs at a height of 82 feet above the level of the Thames; from which pipes would convey the water to the houses on the south side of the Thames.

It is not improbable, that before many years have elapsed, some such undertaking as this will be set on foot; although we are not aware that any steps have been yet taken towards its accomplishment.

If we place out of consideration for a moment the deficient purity of the Thames water, we cannot but admit that the mode in which so large a city as London is supplied with water is very admirable. There are but few houses which have not an adequate supply. The system of conduit pipes, which run like arteries through the streets of the metropolis, are kept constantly filled by being in connection with reservoirs which are always elevated. There is an important law in hydrostatics, by virtue of which, water flowing from an elevated source will rise to an equal elevation if conveyed in pipes from one station to another. To take an example: the New River, when it has flowed into the New River Head at Pentonville, is forced up into an elevated reservoir by steam power. This reservoir is equal in height to almost any house in London: consequently, when the main pipes are carried from that reservoir to any street, and leaden pipes are carried from those mains through a house, the water from the reservoir will penetrate to any required apartment, provided that the absolute height is not greater than the height of the reservoir.

What we have now said about river water, as connected with the supply of London, will serve to indicate more or less the plans pursued in other towns. In some places, water is brought to the houses in carts. In others, pumps are fixed at convenient spots, from which spring water is obtained. Those who, like the inhabitants of London, have a plentiful supply of water, can scarcely conceive the misery and filthiness which follow a deficiency of this useful article. There is perhaps no great city in the world which excels London in cleanliness; and although this may in part be doubtlessly attributed to the habits of the people, it is equally certain that the plentiful supply of water is an important agent in the continuance of that very desirable condition.

4. *Lake Water.* Our principal purpose in making a distinction between lake water and other waters, is to notice the contrivances which have been adopted for purifying stagnant or foul water. Most of the large lakes, such as those in Canada, are either salt, like the ocean, or fresh and pure for drinking, like river water. They are the receptacles or reservoirs of numerous rivers, the water of which flows through those lakes to the ocean. But if a body of water such as we should call a *pond* have no outlet by which the water can flow, it must inevitably become unfit for drinking, from the decomposition of animal and vegetable matter, and the presence of dirt, gravel, &c. It must be borne in mind, that evaporation conveys away only the pure water in the state of vapour, and leaves the saline and other impurities behind, whereby the water becomes more and more contaminated. It is to such causes as these that we must attribute the formation of the Natron Lakes of Egypt, in which a quantity of carbonate of soda is found. The evaporation from such lakes takes up only the pure water.

If water be pure in itself, it soon acquires an unpleasant taint if left stationary, or deprived of free access of air: a fact which our own water-cisterns would soon show, were not the supply of water so abundant. Dr. Saunders, in his "Treatise on Mineral Waters," says, "No water carried to sea becomes putrid sooner than that of the Thames. When a cask is opened, after being kept a month or two, a quantity of carburetted or sulphuretted hydrogen escapes, and the water is so black and offensive as scarcely to be borne. Upon racking it off, however, into large earthen vessels, and exposing it to the air, it gradually deposits a quantity of black slimy mud, becomes clear as crystal, and remarkably sweet and palatable."

It may with correctness be said, that spring water is *filtered* river water; for by its percolation through sand or gravel it becomes strained or screened from the impurities which it held in solution. But at the same time it imbibes that slight mineral taint which we allude to by the term "hard." If therefore we could obtain it in a state of purity without the addition of lime, we should gain a decided advantage. Now this is accomplished by the *filter*, which has always some porous substance through which the water percolates. Northamptonshire sandstone and Derbyshire gritstone are frequently employed for this purpose. They are cut into the form of a hollow basin, which is filled with the impure water. The water penetrates through the pores of the stone, and is, in its passage, freed from all the impurities which before tainted it. One defect of this mode of purifying is, that the pores of the stone become gradually choked up by the particles of dirt, &c., left behind by the water.

Mr. Moult devised an apparatus in which the filtering basin was placed in another vessel, and the water, being poured into the outer vessel, penetrated through the stone into the inner basin. Another filter was made by Hempel, of a composition of four parts of tobacco-pipe clay, and five parts of coarse sand. In fact, the contrivances are very numerous, but the mode of action is nearly the same in all. The following has been recommended as a

simple filter for domestic use:—procure a cylindrical vessel of any convenient material, with a cock inserted near the bottom; and to the top of it fit another vessel (like the steamer of an iron saucepan) with holes in the bottom. Cover this perforated bottom with a piece of coarse cloth, and over that place a layer of fine sand or gravel. The water is then to be poured into this upper vessel, from which it filters slowly through the gravel, into the lower vessel. It is desirable to place a thin board, perforated with small holes, upon the gravel, to prevent the water from washing up and disturbing the gravel. The filtered water is then drawn from the lower vessel by the cock. If the water be very impure, the stratum of gravel must be thicker.

The choking of the pores of filtering stones by the sediment, &c., has led to the adoption of a mode of filtering by ascension; in which the impure water descends from a height before it percolates through the filter, which it does in an upward direction, and thereby leaves the sediment to settle at the bottom. A filter of this description was some years ago proposed by Professor Parrot of Paris, in which a reservoir or pump discharges the water which is to be filtered into a tube, which may be made of lead or other convenient material, and which is bent into the syphon form. In the lower part of the bend, sand is placed, and a small layer of gravel is placed on the sand. The water, therefore, has to filter through the gravel and sand, depositing its grosser impurities among the former, and the rest among the latter.

The same principle may be employed in a very simple and available manner by the following contrivance:—a cask or earthen pan is divided into two compartments by a division down the middle. This division does not, however, reach quite to the bottom, but only to a certain point, by which a communication is kept open between the two compartments. The bottom of the vessel is then to be filled with sand to a short distance above the point; and a layer of gravel is placed upon the sand. The water being then poured into one half of the vessel, filters down through the sand and gravel into the other division, from which it may be drawn off either by dipping, or by a cock inserted into the side of the vessel. By this arrangement, the sand may be cleared out, and the vessel cleaned with great ease. If the water be very impure and tainted, charcoal may be substituted for the sand, on account of its remarkable purifying qualities.

A Prairie.—The first view of a prairie will probably excite more surprise in the mind of a traveller in the United States than the grandest objects of nature. Riding day after day through forests, in which the cleared land is not of sufficient extent to interrupt the general aspect of wood, he breaks at once upon the view of a fine open country—he beholds extensive plains of the most soft and beautiful verdure, covered with flowers of every scent and hue. Occasionally on the prairie, and often in the centre, are clumps of fine trees, especially of the oak and black walnut, so charmingly disposed, that the traveller can hardly believe that they have not been placed by the hand of man. The views of tracts of country of this description are in many places far more extensive than are to be met with in any country whose land has been laid out in this way artificially, with a view to its beauty, and to increase its value to its possessor. The prospect from the high grounds that often surround the prairies, comprehending verdant lawns, large forests, through which vast rivers are rolling their mighty masses of water, and fine hills in the distance, with cottages, cattle, horses, and deer, is altogether as fine as can be conceived anywhere.—*Stewart's Three Years in America.*

Exportation from Ireland.—There were imported into the Port of Liverpool from Ireland, during the year 1837, 84,710 Oxen and Cows, 316 Calves, 225,050 Sheep, 24,669 Lambs, 595,422 Pigs, 3,414 Horses, 319 Mules; the value of which is computed to be above three millions sterling. Grain and other descriptions of agricultural produce to an immense amount were likewise imported from Ireland; and it has been stated on good authority, that the value of the single article Poultry-feathers, annually brought from Ireland to England, exceeds 500,000*l.*

The Magnetic Pole.—In the year 1819, Sir Edward Parry, in his voyage to discover the north-west passage round America, sailed near the magnetic pole; and in 1824, Captain Lyon, on an expedition for the same purpose, found that the magnetic pole was then situated in 63° 26′ 51″ north latitude, and in 80° 51′ 25″ west longitude. It appears, from later researches, that the law of terrestrial magnetism is of considerable complexity, and the existence of more than one magnetic pole in either hemisphere has been rendered highly probable; that there is one in Siberia seems to be decided by the recent observations of M. Hansteen,—it is in longitude 102° east of Greenwich, and a little to the north of the 60th degree of latitude: so that, by these data, the two magnetic poles in the northern hemisphere are about 180° distant from each other: but Captain Ross, who is just returned from a voyage in the Polar seas, has ascertained that the American magnetic pole is in 70° 14′ north latitude, and 96° 40′ west longitude. The magnetic equator does not exactly coincide with the terrestrial equator; it appears to be an irregular curve, inclined to the earth's equator at an angle of about 12°, and crossing it in at least three points, in longitude 113° 14′ west, and 66° 46′ east of the meridian of Greenwich, and again somewhere between 156° 30′ of west longitude, and 116° east.—*Mrs. Somerville's Connexion of the Sciences.*

Temperature of the Polar Circle.—Captain Back says, in his 'Journey to the Arctic Sea,' that he frequently pursued his astronomical observations when the thermometer stood at 70° below zero. "Such indeed (he remarks) was the abstraction of heat, that, with eight large logs of dry wood in the fireplace of a small room, I could not get the thermometer higher than 12° plus. Ink and paint froze. The sextant cases, and boxes of seasoned wood, principally fir, all split. Nor was the sensation particularly agreeable to our persons; the skin of the hands especially became dry, cracked, and opened into unsightly and smarting gashes, which we were obliged to anoint with grease. On one occasion, after washing my face within three feet of the fire, my hair was actually clotted with ice before I had time to dry it. From these facts some idea may, perhaps, be formed of the excessive cold. It seemed to have driven all living things from us. we had been accustomed to see a few white partridges about, but even these, hardy as they are, had disappeared. Once, indeed, a solitary raven, whose croak made me run out to look at him, swept round the house, but immediately winged his flight to the westward. Nothing but the passing wind broke the awful solitude of this barren and desolate spot."

Restrictions on Trade.—One of the prerogatives assumed by the crown in those days was the right of restricting all mercantile dealings whatever, for a time, to a certain place. Thus, Matthew Paris tells us that, in the year 1245, Henry III. proclaimed a fair to be held at Westminster, on which occasion he ordered that all the traders of London should shut up their shops, and carry their goods to be sold at the fair, and that all other fairs throughout England should be suspended during the 15 days it was appointed to last. The king's object, no doubt, was to obtain a supply of money from the tolls and other dues of the market. What made this interference be felt as a greater hardship was, that the weather, all the time of the fair, happened to be excessively bad; so that not only the goods were spoilt, exposed as they were to the rain in tents only covered with cloth, and that probably imperfectly enough; but the dealers themselves, who were obliged to eat their victuals with their feet in the mud, and the wind and wet about their ears, suffered intolerably. Four years afterwards, the king repeated the same piece of tyranny, and was again seconded by the elements in a similar fashion. This time, too, the historian tells us, scarcely any buyers came to the fair; so that it is no wonder the unfortunate merchants were loud in expressing their dissatisfaction. But the king, he adds, did not mind the imprecations of the people.—*Pictorial History of England*, vol. i.

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.

LONDON:—CHARLES KNIGHT & CO., 22, LUDGATE STREET.

Printed by WILLIAM CLOWES and SONS, Stamford Street.